DOCUMENT RESUME

ED 393 831 SP 036 583

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TITLE Technology and Teacher Professional Development.
INSTITUTION Rand Corp., Santa Monica, Calif.
SPONS AGENCY Department of Education, Washington, DC. Office of Education Technology.
REPORT NO DRU-1045-CTI
PUB DATE Mar 95
NOTE 15p.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Educational Innovation; *Educational Technology; Elementary Secondary Education; *Faculty Development; Federal Government; *Government Role; *Information Technology; Inservice Teacher Education; Models; Teacher Improvement; Teachers; *Technological Literacy; *Workshops
IDENTIFIERS Goals 2000; *Technology Utilization

ABSTRACT

This report summarizes the first of four workshops organized to take advantage of the experience and insights of those already implementing new technologies in the schools. The workshop examined professional development needs and consisted of a one and one-half day conversation with educators and experts working to apply communications technology to the school system. Participants discussed the need to re-examine the basics of professional development, to deal with the anxieties and organizational issues that hinder technology use, and to generate realistic expectations about what technology can accomplish. Limitations and practical difficulties identified included: technology is not that advanced; school systems have already invested in technologies that are diverse and complex; there are significant costs associated with connecting schools to the information highway; and limited attention has been paid to the quality of the materials available. Participants identified several ways the federal government could respond: (1) taking a leadership role in generating public support; (2) sponsoring research concerning both professional development and technology as a teaching tool; (3) supporting demonstrations and models for using technology for professional development; (4) taking a more active role in promoting the use of technology in professional development, including development of training materials and resources; and (5) advancing standards for communications infrastructure. Time was cited as the most common barrier to professional development. The sense conveyed during the workshop was that the professional development community is still redefining its own role and only beginning to understand how technology can be used as a tool to support ways people teach and learn. An appendix lists the workshop participants. (ND)

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ED 393 831

RAND

Technology and Teacher Professional Development

James Harvey and Susanna Purnell (Editors)

DRU-1045-CTI

March 1995

Prepared for *Office of Educational Technology, U.S. Department of Education*

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
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PREFACE

Urged by both the President and Vice President, federal officials have been exploring how to encourage greater and more effective use of modern telecommunications and computer technologies in the nation's schools. In July 1994, RAND's Critical Technologies Institute (CTI) completed a broad investigation of educational technology for the Office of Science and Technology Policy and the National Science and Technology Council. This preliminary work examined the nature and level of federal efforts to assist educators and trainers and an assessment of major barriers to further progress.

On the basis of this preliminary investigation, the U.S. Department of Education asked CTI to assist the department as it responded to new provisions in the 1994 *GOALS 2000: Educate America Act*, provisions calling on the Secretary of Education to provide a plan for effective utilization of new technologies in the nation's classrooms. Initially sought by March 1995, the deadline for the plan was postponed by subsequent legislation until September of the same year.

This report summarizes the first of four workshops organized to take advantage of the experience and insights of those already implementing new technologies in the schools. This first workshop examined professional development needs, and like the others, consisted of a one and one-half-day conversation with educators and experts working to apply communications technology to the school system. Appendix A lists the participants.

Two subsequent workshops have also been summarized in similar formats. They include *Planning and Financing Education Technology* (DRU-1042-CTI) and *The Market for Educational Software* (DRU-1041-CTI). A fourth workshop, on equity, is in the planning stages.

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TECHNOLOGY ANDS TEACHER PROFESSIONAL DEVELOPMENT

Workshop participants believe that professional development as currently conceived and delivered--one-shot seminars, an afternoon with an expert, or 200 teachers in a gymnasium--will not bring the profession up to speed with emerging school reforms. Something more serious and sustained is needed, or as one participant remarked, "we need to put professional development in the schools' water supply."

Most believed that access to information through powerful new technologies promises to fundamentally reshape school practice, in ways still dimly understood. On the other hand, the workshop discussion conveyed the sense that bureaucratic inertia, inherited lines of authority, attitudes about appropriate role and authority of teachers, and organization of schooling by clock and calendar represent powerful forces in defense of the *status quo*.

The issue before the workshop was the opportunities technology offers for professional development, a topic that generated a wide-ranging discussion. Participants talked about the need to re-examine the basics of professional development, to deal with the anxieties and organizational issues that hinder technology use, and to generate realistic expectations about what technology can accomplish. Participants also suggested ways the federal government could promote the development of technology in support of professional development. The general sense of the workshop was that the education community is just beginning to explore how new technologies might support professional development.

A VISION OF TECHNOLOGY IN SUPPORT OF LEARNING

It is difficult to think about professional development and technology in the abstract. A vision of technology in support of learning is essential. Jinny Goldstein, for example, described a PBS program that ties professional development to new mathematics standards and suggested that standards, or similar goals, should be the guiding

force of any new effort to use technology to improve teacher development.

Ann Lieberman suggested the need to reverse the normal conversation. "The question we need to ask ourselves is not 'What technologies do we have and how can schools use them?' It is 'What do we need in education--and how can technology contribute?'" Once the needs are identified, then professional development experts need to sit down and talk with technology experts about how to meet those needs.

However, starting with goals or educational needs and then looking to how technology can contribute is likely to reveal a huge gap between aspirations and realities. For example, a recent NEA survey found that 75 percent of American classrooms have either only one computer or none at all. Barbara Yentzer suggested that what was required was to "leapfrog the here and now" to create a vision of what professional development and teaching and learning can be like using new technologies. However, Yentzer cautioned, this amounts to a real challenge when teachers do not have access to this equipment in their classrooms and cannot imagine of the possibilities if they have never experienced them.

TEACHER ANXIETIES

Not being able to imagine a practical use for technology may be at the heart of teacher anxieties about technology. Kathleen Fulton pointed out that while technology tools are what is new about professional development, teachers see little benefit in it for themselves. The result is the "17 percent problem," i.e., the technicians and visionaries who make up 17 percent of the population "see" a potential for technology and begin using it. But the majority are not interested until they see some practical benefits.

There was general agreement about that the "17 percent problem" underlies teacher anxiety. Lieberman suggested that not only most teachers but most staff developers do not understand how to think about this. They are tied to the "direct instruction" model and do not understand the possibilities inherent in the new techniques. The challenge is to find some way that teachers can understand this as an

opportunity rather than a threat. This is going to take some powerful tools that are genuinely useful to teachers in making the pedagogical shift from being the "sage on the stage" to mentors who are "guides on the side."

Another suggested reason for teacher anxieties is that teachers do not trust the system to provide them with the support they need to make these new technologies work. Goldstein, for example, noted that PBS often faced interference implementing a math professional development program, including principals holding on to the software. Teachers were worried that they would be blamed for any failure, when it was the system that failed to support them.

As the teacher workforce turns over, attitudes toward technology may shift. The NEA survey indicates that currently teachers have more computers and modems in their homes than the general population. Moreover, although teachers in general think that access to VCRs and photocopiers is more important than access to telephones and computers in their classrooms, that finding is reversed when only younger teachers are examined. This suggests a powerful shift in teacher attitudes on the horizon.

In the meantime, introducing technology as a useful tool takes time and individual hand-holding. It is an on-going process, not a static event. Susan Mernit, for instance, indicated that it took Scholastic ten months just to build a teachers' network involving 125 people.

SCHOOL CULTURE AND ORGANIZATION

In fact, the question of the clock, the school calendar, and time became a major part of this discussion, particularly as the conversation turned to teacher needs. Participants argued that schools have yet to create the time teachers need for professional development. Lieberman, for example, warned against adopting technology in order to do the same old thing. Instead, any new instructional system incorporating technology should create time for teachers, improve the quality of group decision-making, and cut down on the incredible amount of "administrivia."

In essence, it was argued that technology should be used to advance a new kind of school culture supporting a new kind of professional development. Several participants offered some guiding principles. First, effective professional development needs to be child-centered and student-owned. Technology as a tool needs to be integrated into every aspect of school life so that the curriculum and child's needs drive technology, not the reverse. Second, this requires new models of staff development that encourage bottom-up energy rather than top-down change. This means not only ending teacher isolation but building human networks in an infrastructure that includes teachers, parents, principals, school board, and district personnel. Finally, the school has to be a "safe haven" for learning and growth and the inevitable mistakes that accompany both.

Goldstein summed up several views concerning staff training when she listed the lessons learned from the implementation of the PBS Mathline project. Teachers did not want a model nor an ideal classroom. They wanted a situation in which they could learn from both their achievements and mistakes. They wanted sustained staff development; not short-term programs. They wanted teacher-controlled programs, not top-down directives. They wanted programs that would advance them intellectually and professionally. And they wanted flexibility in terms of the time when the programming was offered--so that they could complete the program on their own schedule, and if necessary their own time.

Nancy Hechinger's discussion of the Technology as a Second Language curriculum developed for the Edison Project illustrates the way curriculum can be used to drive technology and eventually promote a transformation in the school culture. The guiding standards are the "Three C's"--comfort, confidence, and creativity. In the first year teachers simply become comfortable with the new technologies, the second they develop the confidence to use it, and during the third year and later, it is expected that teachers will become creative users of technologies, such as Internet, CD-ROMs, video images, sound, and multi-media.

THE BRICK WALL AND OTHER PROBLEMS

During the course of the workshop, participants identified some of the limitations and practical difficulties associated with incorporating technology.

- *The technology is not that advanced.* Lydia Wells Sledge, a state official dealing with technology services, noted that educators have had a lot of disappointments in terms of overestimating the capabilities of technology and then dealing with the disillusionment when expectations were not met. Hechinger provided an example in which Edison loaded extensive software onto teachers' personal computers, such as an office suite, some curriculum frameworks and a daily organizer including a calendar and grade book. The intent was to link tools teachers use everyday in a seamless fashion using the technology. However, early on the approach ran into a brick wall. The operating system was completely stressed because each program required a separate interface. The experience was especially frustrating because using technology proved not as useful as the old fashioned pencil and paper approach, and the brick wall was in place even before the more sophisticated HyperCard stacks and video-disks were added.

- *School systems have already invested in technologies that are diverse and complex.* There is a tendency to talk about technologies as if they were all the same thing. Yet there are major differences even between computers that stand alone and those that are networked. Mark Steinberger, a district technology coordinator, added that beyond that is the complexity of the various technologies already in place. Everyone has different equipment, different modems and different log-on procedures. There are different protocols for doing this and for doing that. Somehow standard interfaces need to be developed so that different technologies can work compatibly with each other.

An additional factor is constant change and updating of the equipment and software. In one example, Karen Billings observed that Microsoft is issuing a new platform in 1995 that will require training 16 million people worldwide, including more than one million teachers.

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• *There are significant costs associated with connecting schools to the information highway.* The goal of connectivity is expensive and one that can be achieved only in the long term. Again, Steinberger cited just some of the difficulties New York City is encountering. Many of the school buildings are too old to sustain the wiring and in the case of schools with asbestos it is prohibitively expensive. Moreover, rates for telephone usage is high, the same as for business calls. Even looking out to the next five to seven years, it is unlikely that all the schools in the district will be on line.

The striking aspect of this lack of connection is that it is not entirely clear that schools and school systems are prepared to take advantage of such hook-ups. There were only limited responses to the question of what participants would do if all the schools were networked. Donna Munley suggested that just assuming the availability of technology will change a school is unfounded. Teachers are all at different stages in their careers with varied learning styles and this needs to be considered.

Providing adequate support may prove key. Wells recounted that when Kentucky began wiring schools, they found teachers needed help at the site. The state created a school technology coordinator position at each site, providing coordinators with training in the expectation that they would in turn help individual teachers. Mernit and Yentzer indicated that having moderators for on-line conversations was crucial to keeping such dialogues on track and useful.

• *Limited attention has been paid to the quality of the materials available.* A problem identified by some participants is that it is difficult to judge the quality of the software and other materials available. There are no "standards of goodness." While the Internet and other networks allow teachers to browse a wealth of materials, much of the material is simply put on the line without any form of review. This devalues the usefulness of clearinghouses like ERIC.

FEDERAL ROLE

A key question for the workshop participants was identifying ways the federal government could play a useful role. Linda Roberts, director of the Office of Technology in the Department of Education, noted it will take a national investment of about $10 billion to wire every school. That is not a federal investment, but the federal government has some role to play in moving education along. Participants identified several ways the federal government could respond.

Public Engagement. Although the participants saw the potential for technology, there was a realization that the nation needs to be convinced that such a large-scale investment makes sense. The federal government can take an important leadership role in generating public support by helping establish the need. Several participants pointed out that the justification is fairly straightforward. These technologies are already in our homes and the business world. If schools are going to prepare students for the world they are entering, then schools need these technologies too. The need is all the more important in low-income communities in which the schools may be the only compensation for the lack of technology access at home and in the community.

Research. Participants looked to the Department of Education to sponsor studies concerning both professional development and technology as a teaching tool. Workshop attendees called for a review of professional development practices over the past 50 years, an analysis of what kind of changes must be made in professional development to support the changing role of the teacher, and an examination of what role technology might play to support those changes. There is a lack of basic research determining the effectiveness of various strategies that use technology both for student and adult learning. Such studies are key to applying technology to both teacher education and professional development. Finally, attendees suggested that research is needed to understand how technology influences the school as a workplace.

Models and Demonstrations. Participants also suggested that the Department of Education apply its traditional role of supporting

demonstrations and models to using technology for professional development. Among the suggestions: (1) on-line staff development capabilities; (2) regional training centers aimed explicitly at teacher needs; (3) model dissemination kits of best practices in professional development; (4) demonstrations using electronic publishing to update textbooks or other materials; and (5) state and district models for financing technology in the schools.

Training Materials and Resources. Attendees also suggested that the federal government take a more active role in promoting the use of technology in professional development. For example, it was suggested that the Department of Education employ the role of convener to facilitate meetings between the professional development and technology communities. Federal grant funds could be used to develop professional development materials, such as video libraries of best practices or multi-media packages (e.g., CD-ROMS) supporting emerging national standards and curriculum frameworks. The ERIC data base could be expanded to include a "who's who" directory of experts on technology and professional development.

Infrastructure. There was general agreement that developing common standards for communications among various systems is important and that the federal government is well positioned to play a key role in advancing those standards. Interfaces need to be common enough that teachers and others can gain access to the various resources in the "technology pipeline" as they need it, when they need it, and where they need it--at home, at school, and at work. In addition, teachers and students need more user friendly tools to navigate the information highway.

IMPLICATIONS

The overwhelming sense of the meeting was that current professional development is shallow, both in definition and delivery. The basics for professional development are not in place. Several attendees called for a basic review of what we know about professional development, including emerging definition changes, and how new technologies might fit in.

Moreover, participants repeatedly named time as the most common barrier to change. The education system as currently structured does not pretend to make available to teachers the amount and kind of time needed to develop professionally. Time not spent in front of a class is considered somewhat wasted.

Participants offered insights into what technology brings to professional development as well as some sense of the barriers and challenges to the use of technology.

Participants were enthusiastic about the opportunities technology provides, including:

- *Models of practice:* New technologies can provide multi-media images demonstrating real teachers in real classroom settings. In part this provides logistical convenience: I can see a classroom without having to travel to it. More fundamentally, participants' enthusiasm rested on the power of these technologies to demonstrate images of good practice.
- *On demand professional development:* Technology allows teachers and professional developers to change the time frame of professional development. In place of seminars or workshops in particular places, at particular times, videos, CD-ROMS, networks, and software are resources that can be archived and called upon as needed.
- *Ending isolation:* Technology provides teachers with another way to break out of the isolation that often binds them. Telephones, fax machines, voice mail, local area networks (LANS) and wide are networks (WANS) permit conversation, discussion, exchange of information, and access to information otherwise difficult to attain. At its most ambitious, this benefit is seen as providing a pipeline big enough to carry an entire array of public and private services to everyone in a school district. Although everyone would obtain some of these services, individuals, schools, and districts also would subscribe to selected private services.

In a sense, the issue of technology in professional development is not the technology itself--which is available, developing, and moving

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on, whether or not professional development takes advantage of it--but how best to use technology. The challenge is not only to increase the density and scope of information and communication, but to do so in a meaningful way. Technology can offer the advantage of allowing the teacher to move through materials, use them, and interact with them at the teacher's own speed. Such application of technology would be a real departure from much of the current professional development in which the ideas, materials, and their use are generated, structured, and validated at some distance from the teacher himself.

Workshop participants recognized that technology has its limitations. First, the "interface" issue continues to be a problem. Differences in software and log-on procedures can frustrate even the most sophisticated systems. Second, there are limits to the individual's ability to deal effectively with more than a handful of different technologies, something already recognized in the private sector. And third, even relatively small networks have difficulty maintaining themselves without on-going guidance and support from a genuine flesh-and-blood person. Meaningful use of technology requires a lot of support.

The sense conveyed during the workshop was that the professional development community is still redefining its own role and only beginning to understand how technology can be used as a tool to support how people teach and learn.

Appendix

A. WORKSHOP PARTICIPANTS

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